

2.0 SITE DESCRIPTION AND HISTORY

This chapter provides a summary of background information for the Former Waikoloa Maneuver Area and Nansay Sites including location, historical background, existing facilities, current and future land uses, demographic profile, regional geology, and biological and cultural resources. Information regarding past military operations was obtained primarily from data presented in the *Defense Environmental Restoration Program - Formerly Used Defense Sites Trip Report, Waikoloa Maneuver Area, Waikoloa, Island of Hawai'i, Hawai'i* (U.S. Army Corps of Engineers, Pacific Ocean Division, 1991); the *Defense Environmental Restoration Program - Formerly Used Defense Sites Inventory Project Report, Lalamilo Firing Range, Lalamilo, South Kohala, Hawai'i* (U.S. Army Corps of Engineers, Pacific Ocean Division, 1993); the *Defense Environmental Restoration Program - Formerly Used Defense Sites Inventory Project Report, Nansay Hawai'i, O'uli and Puako, Island of Hawai'i, Hawai'i* (U.S. Army Corps of Engineers, Pacific Ocean Division, 1996); and the *Ordnance and Explosives Archives Search Report, Waikoloa Maneuver Area/Camp Tarawa, South Kohala District, Island of Hawai'i Hawai'i* (Earth Tech, 1997b).

2.1 SITE DESCRIPTION AND HISTORY

2.1.1 Location of the Former Waikoloa Maneuver Area and Nansay Sites

The Former Waikoloa Maneuver Area and Nansay Sites are situated on the Island of Hawai'i, Hawai'i, on the northwest side of the island approximately 30 miles north of the city of Kailua-Kona in the South Kohala District (see Figure 1-1). The former maneuver area is bordered by Queen Kaahumanu Highway (State Highway 19) on the west, the South Kohala/North Kona District boundary line to the south, the South Kohala/Hamakua District boundary line to the east, and Kawaihae Road to the north.

2.1.2 Meteorology

Due to the large size and varied elevation (i.e., sea level to 5,500 feet above mean sea level [MSL]) of the former maneuver area, several climatic zones are present. At the westernmost boundary where the former maneuver area nears the Pacific Ocean, the climate is classified as a hot desert. As the land rises eastward up the slope of Mauna Kea, the former maneuver area is transected by a band of hot, semidesert conditions that terminate at its far eastward reach in a summer-dry, warm temperate climate. Temperatures within the former maneuver area range from the high 90s to the low 50s (in degrees Fahrenheit).

The leeward position of the former maneuver area, in the rain shadow of Mauna Kea, makes it one of the drier regions in Hawai'i. Precipitation throughout the former maneuver area ranges between 10 and 20 inches per year.

The wind patterns of the State of Hawai'i are characterized by northeasterly trade winds generated by a high-pressure center north of the islands. These winds are generally strongest during the summer and are periodically disrupted by storms in the winter. Within the former maneuver area, the trade wind force normally has a diurnal variation caused by differential rates of cooling and heating of the land. Light winds predominate during the morning hours, and strong steady winds (15 to 30 miles per hour) occur throughout the rest of the day. Wind erosion is common in areas with loose, dry soils.

2.1.3 Physiography and Topography

The rolling terrain characteristic of the former maneuver area encompasses two physiographic landforms: slightly dissected uplands and lava plains. The upland area of the slope is cut by widely spaced gullies formed by erosion, while the lava plains are broad with little topographic relief. The lava areas are pocked and scarred by lava blisters and stacks formed by gas pockets rupturing the surface and breaking the lava's crust. Caves and lava tubes are prevalent in these areas.

From its coastal origin in the west, the former maneuver area rises eastward up the slope of Mauna Kea to a height of approximately 5,500 feet above MSL. Except at its easternmost boundary, the slope of the land is less than 10 percent (Photograph 2-1).

Among the prominent landforms in the former maneuver area are ancient cinder cones. Pu'u Pa cinder cone rises approximately 300 feet (elevation 2,667 feet above MSL) above the pastureland west of Mamalahoa Highway (Photograph 2-2). To the east of Mamalahoa Highway is Holoholoku cinder cone, which rises approximately 350 feet (elevation 3,265 feet above MSL) above the mildly sloping grasslands. South of the intersection of Mamalahoa Highway and Saddle Road is the Nahonaohae Pu'u. This pu'u and the surrounding area is a conservation area for native Hawai'ian plants. South of Waikoloa Road is Pu'u Hinai, a cinder cone approximately 1 mile southeast of Waikoloa Village.

2.1.4 Surface Water

There are no permanent watercourses in the vicinity of the former maneuver area due to the low level of annual precipitation. Waikoloa Creek and other minor watercourses are seasonal, flowing only during the rainy season (typically November through April) and at times subject to occasional flash flooding. Sheet wash (or sheet flooding) is known to occur in downslope areas throughout the former maneuver area and is considered a high energy event that causes soil movement, rock movement, and may potentially expose subsurface ordnance that may lie close to the surface.

2.1.5 Geology and Soils

The former maneuver area is situated on rolling upland slopes of ancient basaltic lava flows that are now covered with grassland vegetation and cut by widely spaced erosional gullies. The former maneuver area is surrounded by three of



Photograph 2-1. View of Waimea Plain from Holoholoku looking north.



Photograph 2-2. Cinder cones typically found throughout the former maneuver area.

the five shield volcanoes that compose the Island of Hawai'i; on the north are the Kohala Mountains, the oldest volcanic feature on the island; on the southwest are the Hualalai Cone and Crater; and on the east is Mauna Kea. Coastal land bounds the former maneuver area on the west.

The majority of the former maneuver area lies within the Waimea Plains (see Photograph 2-1). The plains were formed by Mauna Kea lava flows that ponded against the older Kohala Mountains and are now covered with volcanic ash-type soils. The interior plains at Pohakuloa are covered with more recent lava flows from Mauna Loa that banked against Mauna Kea. The lava is predominantly basalt flows and scoria of the Hamakua Volcanics. These rocks, like all Hawaiian basalts, are extremely iron rich (Wolfe and Morris, 1996). The composition of some basalt rocks exceeds 40 percent iron minerals. This high iron content causes geophysical "false positives" in the detection of subsurface ordnance (also iron rich). Not only will the geophysical equipment detect ferrous ordnance, it will also detect iron rich basalt cobbles, subcrops, or changes in the iron composition from one lava flow to the next, depending on its iron content. Basalt, because of its iron rich composition, will oxidize and weather similar to that of oxidized ordnance. Consequently, there can be difficulty in visually discriminating ordnance from oxidized basalt lava flows.

In areas where volcanic flows have not recently occurred, the terrain is eroded by seasonal rivers and streams. In other areas, the terrain is undissected and quite barren, revealing a large area of exposed lava (U.S. Department of Agriculture, 1973).

Soil types within the project area are largely shallow, dry, and/or stony, and are subject to aeolian (wind-blown) conditions leaving a thin veneer of silt loam as a top soil. These soil conditions, along with the semiarid climate, lend itself to large expanses of grassland along with sparse stands of vegetation, including cactus and eucalyptus trees.

According to the Natural Resources Conservation Service, the soils within the former maneuver area can be classified into one of three soil associations: the Kawaihae Association, the Pu'u Pa-Pakini-Waiaha Association, and the Waimea-Kikoni-Naalehu Association.

The Kawaihae Association consists of moderately deep, gently sloping to moderately steep, somewhat excessively drained soils that have a medium-textured subsoil that form in volcanic ash. These soils are found in the west one-third of the former maneuver area (the coastal plains) and extend inland from near sea level to approximately 1,500 feet above MSL. Kawaihae soils have a surface layer of dark reddish-brown and dusky-red silt loam. Bedrock is at a depth of approximately 10 to 40 inches bgs (U.S. Department of Agriculture, 1973).

Pu'u Pa-Pakini-Waiaha Association soils make up the central one-third of the former maneuver area and consist of shallow to deep, nearly level to steep, well-drained to somewhat excessively drained soils that have a medium-textured subsoil or underlying material. These upland soils occur at elevations up to

4,000 feet above MSL and have a concentration of calcium carbonate that occurs as a soil layer or as coatings on rock fragments. Also formed of volcanic ash, these soils have a very dark brown, extremely stony, very fine sandy loam surface layer. Their subsoil is dark brown and dark yellowish-brown, very stony, very fine sandy loam, and can range from 20 to 55 inches bgs (U.S. Department of Agriculture, 1973).

The easternmost one-third of the former maneuver area is characterized by Waimea-Kikoni-Naalehu Association soils. These volcanic ash soils are very deep, nearly level to steep, well drained, and have a medium-textured to moderately fine-textured subsoil. The soils have a dark surface layer that is high in content of organic matter; they occur at elevations ranging from 750 feet to 6,000 feet above MSL (U.S. Department of Agriculture, 1973). Depending upon the location and amount of rainfall, the soil types within the former maneuver area are able to support pastureland and farming of various crops. The remaining areas support habitat for wildlife.

2.1.6 Biological Resources

A brief description of sensitive plants and wildlife at the former maneuver area is provided in the following paragraphs. A report is currently being prepared by the U.S. Fish and Wildlife Service (USFWS) concerning biological and natural resources on the Island of Hawai'i.

2.1.6.1 Vegetation.

The presence of plant species within the former maneuver area is closely related to elevation and climatic factors (e.g., temperature, rainfall). Vegetation at the former maneuver area is generally classified as Coastal Dry Communities consisting of dry grasslands, dry shrublands, and dry forests and Lowland Dry Communities consisting of fountain grass grasslands and remnants of native Hawai'ian forests (Palmer and Paul, 1999). The primary pasture grasses are buffelgrass and fountain grass. Eucalyptus is present in a grove and along the southerly base of Pu'u Pa. Random stands of cactus are present throughout the former maneuver area (U.S. Army Corps of Engineers, Pacific Ocean Division, 1997).

In 1997, a flora and fauna survey of the former maneuver area was conducted by Wil-Chee Planning, Inc. (Wil-Chee) (U.S. Army Corps of Engineers, Pacific Ocean Division, 1997). Areas in the north-central region of the former maneuver area were recorded as having been intensely impacted by grazing and a variety of anthropogenic stresses; therefore, these areas are poor habitats for endangered plants. The Parker Ranch pasturage in this area exhibited relative homogeneity throughout with regard to topography and plant species variation and did not contain refuges or zones inaccessible to grazing livestock. During this survey, only one endangered plant or plant species of concern was discovered by the project botanists. Thirty-four individual plants of *Portulaca sclerocarpa* were found on Pu'u Pa scattered from the base of the pu'u to just below its summit.

The most significant vegetation feature in the project area is an approximately 20 square kilometer area of native Kawelu Grassland, which extends between Kamakoa Gulch to Waiulaula Gulch and west from the rock wall to the coast. The Kawelu Grassland may support native and endangered plant species in normal rainfall years. The majority of the vegetation on the project area is nonnative grasslands (Palmer and Paul, 1999).

Several rare Hawai'ian plant species were observed on the former maneuver area near Waikoloa Village. These species include nehe (*Lipochaeta lavarum*), kauna'oa (*Cuscuta sandwichiana*), 'iliahi (*Santalum ellipticum*), and 'akia (*Wikstroemia pulcherima*) (Palmer and Paul, 1999).

Sensitive Species. *Portulaca scerocarpa*, a federally listed endangered plant or species of concern, was found to occur within the central region of the former maneuver area. The species was found growing as a low or prostrate herb with one to several stems, 10 to 20 centimeters long. It was typically observed on rock microsites between *Pennisetum setaceum* and in proximity to *Portulaca pilosa* plants (U.S. Army Corps of Engineers, Pacific Ocean Division, 1997). Palmer and Paul identified *Portulaca scerocarpa* in the Lalamilo area during their 1999 botanical survey of the project area. The Puako parcel supports a population of endangered flowering maple (*Abutilon menziesii* Seem.) (U.S. Army Corps of Engineers, Pacific Ocean Division, 1996).

2.1.6.2 Wildlife

Mammals. Mammalian species present at the former maneuver area include donkeys, goats, mongooses, and pigs. All of these species were introduced to the Hawai'ian islands and are not native. Although not detected during the biological survey, rats and mice have also been seen within the former maneuver area. Domesticated cattle and horses graze throughout several ranchland areas within the former maneuver area.

During the Phase II EE/CA field investigation, field personnel observed feral donkeys, goats, and pigs in the central and eastern areas of the former maneuver area.

Birds. Sixteen species of birds were recorded during the biological survey conducted by Edward K. Noda and Associates (Palmer and Paul, 1999). The Pacific Golden-Plover (*Pluvialis fulva*) is considered to be a native Hawai'ian migratory species. No avian species listed as either threatened or endangered by the USFWS or the State of Hawai'i have been detected during previous investigations within the former maneuver area (David, 1999).

During the Phase II EE/CA field investigation, field personnel observed wild turkey and pheasant in the east-central region of the former maneuver area.

Sensitive Species. The Dark-rumped Petrel (*Pterodroma phaeopygia sandwichensis*) is an endemic species that is listed as endangered by the USFWS and may occasionally fly over the former maneuver area. However, the area does not provide suitable nesting habitat for this species and the species

was not observed during this survey. Hawai'ian Goose (*Branta sandvicensis*) is another endemic species that is listed as endangered by the USFWS. These species were not observed during this survey; however, it is possible that the species may utilize portions of the former maneuver area (U.S. Army Corps of Engineers, Pacific Ocean Division, 1997).

The Hawai'ian hoary bat (*Lasiurus cinereus semotus*) is Hawai'i's only endemic terrestrial mammal and is listed as endangered by the USFWS and a species of concern for the Hawai'ian Islands. This species was not observed during the survey of the former maneuver area.

No threatened or endangered invertebrates were observed or collected in the areas surveyed. Although not considered a threatened or endangered species, the endemic yellow-faced bee (*Hylaeus sp.*) is a species of concern due to its vital role as a pollinator of the rare, native flora, 'ilima (*Sida fallax*); its limited or threatened habitat; and its vulnerability to predators. It was observed during the survey on 'ilima flowers in the vicinity of the Pu'u Pa Maneuver Area. The genus has been considered for listing by the USFWS.

The former maneuver area supports little habitat for native and sensitive species due to intense cattle grazing and a variety of anthropogenic stresses.

2.1.6.3 Sensitive Habitats.

The Kawelu grassland described in Section 2.1.6.1 is the only sensitive habitat within the former maneuver area. Several native Hawai'ian plant species occur in the Kawelu grassland (Palmer and Paul, 1999).

2.1.6.4 Biological Resources Monitoring.

Biologists from PAC conducted biological resources training for all project field personnel, including descriptions of endangered and rare Hawai'ian species present on the former maneuver area and procedures for notifying the project biologist of significant biological finds. The project biologist illustrated areas of significant biological features (i.e., areas supporting rare species) on the project maps to assist field personnel in avoiding these areas. The project biologist also provided information regarding dangerous and poisonous plants that are present on the former maneuver area. Ongoing work in support of the EE/CA and any future remedial OE response actions will be done in consultation with native Hawai'ian groups and organizations.

2.1.7 Cultural Resources

A brief historic background of the region and a general description of the types of archaeological resources found in previous surveys conducted within the region are provided to introduce the historic context and typical archaeology for the former maneuver area. Information contained in this section is taken from the draft research design for archaeological and biological monitoring (Nees and Williams, 1998). A report is currently being prepared to be issued by the State

Historic Preservation Office (SHPO) concerning cultural resources on the Island of Hawai'i.

Based upon past archaeological excavations, cultural activities can generally be divided into three major phases: the indigenous Hawai'ian occupation prior to 1850, the historic ranching period from 1850 to 1940, and the military and modern use of the area after 1940. Much of the archaeology of the region dates from the historic period. With its fertile soils and plentiful rainfall, the Waimea (Kamuela) area was used extensively for agricultural purposes. Principal crops were taro, bananas, gourds, and sweet potatoes. The Waimea-Lalamilo field system, which was irrigated using 'auwai to divert water from streams, was composed of four complexes south and east of the present town of Waimea.

Cattle were introduced to the region in 1793, and the industry grew throughout the 1800s. In the early 1800s, sandalwood harvesting and cotton farming briefly flourished, but resources quickly became exhausted. By the late 1840s, the majority of the Waimea region was converted to pasturelands. Native residents were forced to move and those remaining built stone walls or fences around their houses and land as protection from cattle, goats, and sheep that destroyed agricultural lands, forests, and dwellings. Military use of the area was initiated in 1943.

Numerous archaeological investigations have been conducted in this region and have been focused mainly along the coast, the town of Waimea (Kamuela), and the Waikoloa Village.

Prehistoric Sites. Numerous prehistoric sites have been identified throughout the former maneuver area. Archaeological sites in the coastal region of the former maneuver area include permanent and temporary habitation structures, rockshelters, petroglyph fields, fishponds, burial sites, and cairns (i.e., trail markers). Inland sites include irrigated fields and ditches, stone platforms, stone walls, possible burial platforms, and prehistoric artifacts (Nees and Williams, 2000).

Historic Sites. Archaeological surveys have identified numerous historic sites throughout the former maneuver area. Many of these sites are related to the ranching and military activities that have taken place. Other types of historic sites identified include agricultural and residential sites and a cemetery (Nees and Williams, 2000).

2.1.7.1 Cultural Resources Monitoring.

IARII provided cultural resources monitoring during the visual reconnaissance and grid survey activities (November and December 2000). IARII conducted cultural resources training for all project field personnel, which included information on the types of resources found on the former maneuver area, procedures for notifying the project archaeologist of cultural resources encountered during EE/CA field activities, and an overview of the applicable state and federal historic preservation laws. The project archaeologist also assisted

with the placement of sampling grids to ensure that cultural resources were not disturbed.

Archaeologists from AMEC Earth and Environmental provided cultural resources monitoring during project activities conducted from January to April 2001. To assist project field personnel in avoiding cultural resources, AMEC provided maps that outlined the areas of archaeological and historic sites. AMEC also conducted additional cultural resources awareness training and briefings as new project field personnel arrived at the site and during the daily morning safety briefing.

2.2 ANALYSIS OF HISTORICAL RECORDS

Prior to writing the Phase II EE/CA Master Work Plan Addendum and performing the Phase II EE/CA field investigation, historical records were reviewed and analyzed. These records included the Archives Search Report (ASR), aerial photographs, and reports from the following investigations:

- *Defense Environmental Restoration Program - Formerly Used Defense Sites Trip Report, Waikoloa Maneuver Area, Waikoloa, Island of Hawai'i, Hawai'i, Site Number H09HI035900* (prepared by the U.S. Army Corps of Engineers, Pacific Ocean Division, 1991).
- *Defense Environmental Restoration Program - Formerly Used Defense Sites Inventory Project Report, Lalamilo Firing Range, Lalamilo, South Kohala, Hawai'i, Site Number H09HI019800* (prepared by the U.S. Army Corps of Engineers, Pacific Ocean Division, 1993).
- *Inventory Project Report, Nansay Hawai'i, O'uli and Puako, Island of Hawai'i, Hawai'i, Site Number H09HI004300* (prepared by the U.S. Army Corps of Engineers, Pacific Ocean Division, 1996).
- *Ordinance and Explosives Archives Search Report, Waikoloa Maneuver Area/Camp Tarawa, South Kohala District, Island of Hawai'i, Hawai'i* (prepared by Earth Tech for the U.S. Army Engineering and Support Center, Huntsville, and the U.S. Army Corps of Engineers, Pacific Ocean Division, 1997).
- *Phase I Engineering Evaluation/Cost Analysis, Former Waikoloa Maneuver Area, Parker Ranch Region, Kamuela, Island of Hawai'i, Hawai'i* (prepared by Earth Tech for the U.S. Army Engineering and Support Center, Huntsville, and the U.S. Army Corps of Engineers, Pacific Ocean Division, 1999).

2.2.1 History of the Former Waikoloa Maneuver Area and Nansay Sites

In December 1943, approximately 91,000 acres were acquired by the U.S. Navy through a licensing agreement with Richard Smart (owner) of the Parker Ranch. Portions of the 91,000 acres were used as an artillery and naval gun firing range, while other portions were used for troop maneuvers and weapons practice. Approximately 467 acres of the property (near the town of Waimea/Kamuela)

were used as a cantonment area for the training area known as Camp Tarawa. Intensive training was conducted around the cinder hills (Figure 2-1).

Exercises were conducted with 30-caliber rifles, bazookas, flame throwers, mortars, and machine guns. The U.S. Marines conducted live-fire exercises with high-explosive (HE) shells, mortars, and barrage rockets and test fired packages of Japanese-language surrender leaflets. There were constant training schedules with demolitions, practice mines, and other special equipment. Large quantities of heavy equipment were brought to the island for the training including construction equipment (e.g., cranes, bulldozers, and tractors), M4A2 and M4A4 tanks, weapons carriers, trucks, and jeeps.

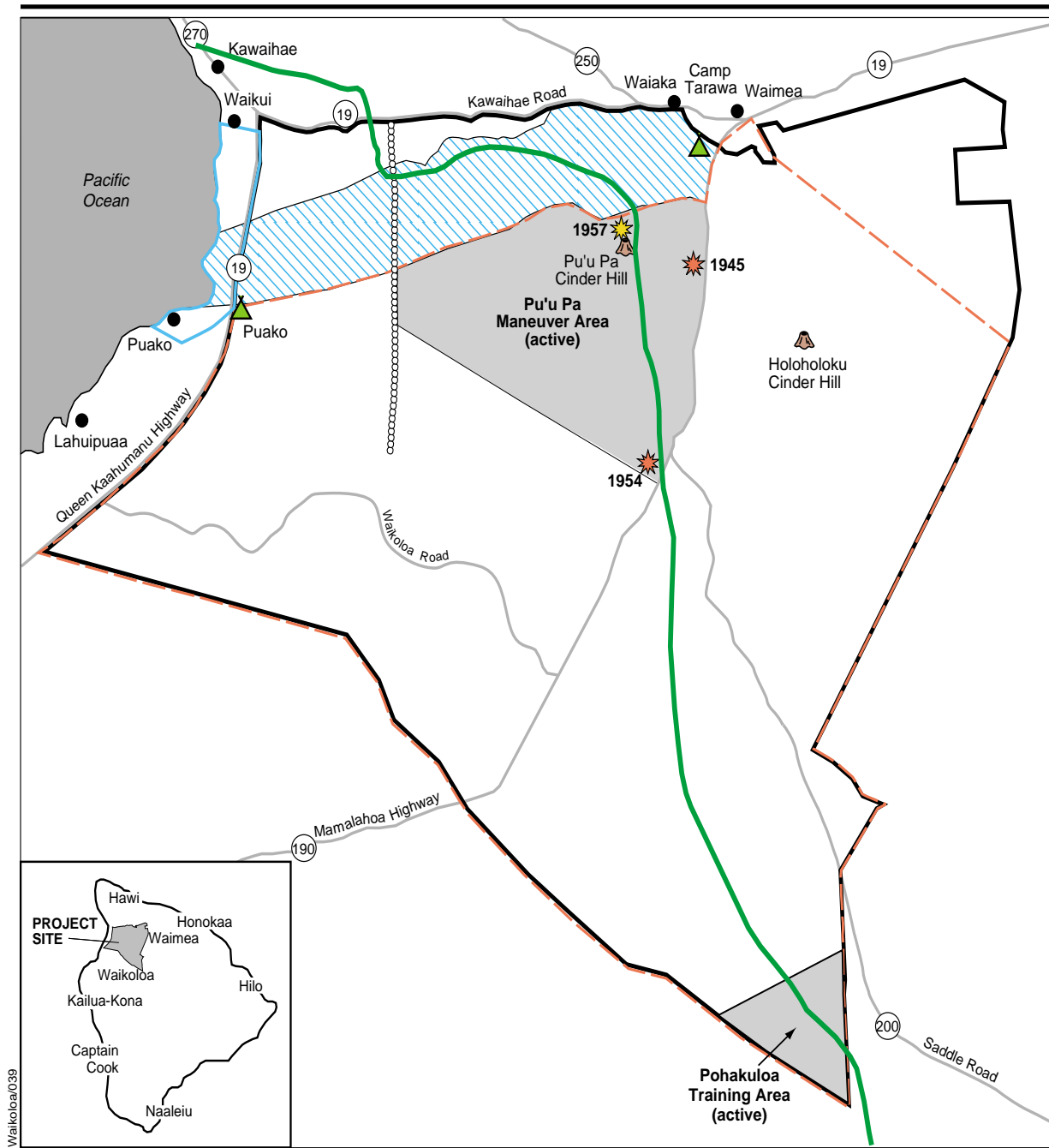
Based upon historic newspaper accounts, previous OE investigations, and previous incidents involving disposal of OE, the following types of OE have been used or identified within the former maneuver area:

- 81-millimeter (mm) HE mortar
- 60mm HE mortar shell
- 2.75-inch rocket
- Japanese 25mm anti-aircraft/anti-tank round
- 47mm anti-tank Japanese armor-piercing projectile
- 37mm anti-tank cannon
- Rifle and hand grenades
- 60mm illumination rounds
- 4.2-inch mortar shell
- 75mm HE shells
- 105mm HE shells
- 155mm HE shells
- Practice land mines
- 22-caliber to 50-caliber small arms
- 2.36-inch rockets
- 3.5-inch rockets
- 4.5-inch barrage rockets
- Mark (Mk)2 hand grenades.

In September 1946, the property comprising the former maneuver area was returned to the Parker Ranch.

The 9,141-acre area known as the Lalamilo Firing Range (see Figure 2-1) was used as a camp site and training area by the U.S. Marines until 1953, through a permit granted by the Territory of Hawai'i. The permit for the Lalamilo Firing Range was cancelled in December 1953, and the Territory of Hawai'i used the land for grazing. The State of Hawai'i has had ownership of the land since 1959.

Today, land use in the former maneuver area is mostly cattle ranching/grazing by the Parker Ranch, with urban-residential, commercial and industrial land uses found proximal to Waimea (Kamuela) and the Waikoloa Village area. Residential expansion is planned to the southeast of the Waikoloa Village area. Recreational growth is planned along Queen Kaahumanu Highway and residential buildings



EXPLANATION

- | | | | |
|--|---------------------------------|--|---|
| | Phase II EE/CA Project Boundary | | Active Military Training Areas |
| | Encampments | | Original Former Maneuver Area Boundary (91,000 acres) |
| | Deaths | | Tank Trail |
| | Injuries | | World War II Amphibious Training |
| | Lalamilo Firing Range | | Cinder Hill |
| | | | Historic Rock Wall |
| | | | |

Historical and Active Military Training Areas

Figure 2-1

and golf courses are planned for the Puako and O'uli parcels (sold by Parker Ranch to Nansay Hawai'i, Inc., in 1960). Portions of the Phase II EE/CA project area continue to be used for military maneuvers and training exercises. These areas include an area utilized by the Pohakuloa Training Area (approximately 2,292 acres) and the Pu'u Pa Maneuver Area (approximately 13,009 acres). Both of these areas were excluded from the Phase II EE/CA investigation. There are approximately 10 military training exercises per year in these areas that typically run 10 to 15 days each.

OE continues to be discovered at the former maneuver area. Fragments from naval rounds (8- and 12-inch or larger) have reportedly been found in close proximity to residential neighborhoods (although evidence of these types of munitions was not identified during the EE/CA field investigation). Individuals who live and work in the area have reported grenades, rockets, and projectiles to the South Kohala Police Department, who has requested disposal of many of these items. Since 1999, the South Kohala Police Department responded to live ordnance reports in six areas within the former maneuver area. These areas included the O'uli Parcel, the Lalamilo Wind Farm, a subdivision in the Waikoloa Village area, an area south of Kawaihae Road near the rock wall, near Waimea Creek, and the Parker Ranch Racetrack Arena. Grass fires in 1998, in the area south of Kawaihae Road, resulted in the accidental detonation of OE. The police provided the following list of potential live OE items that were found in the area of the grass fires.

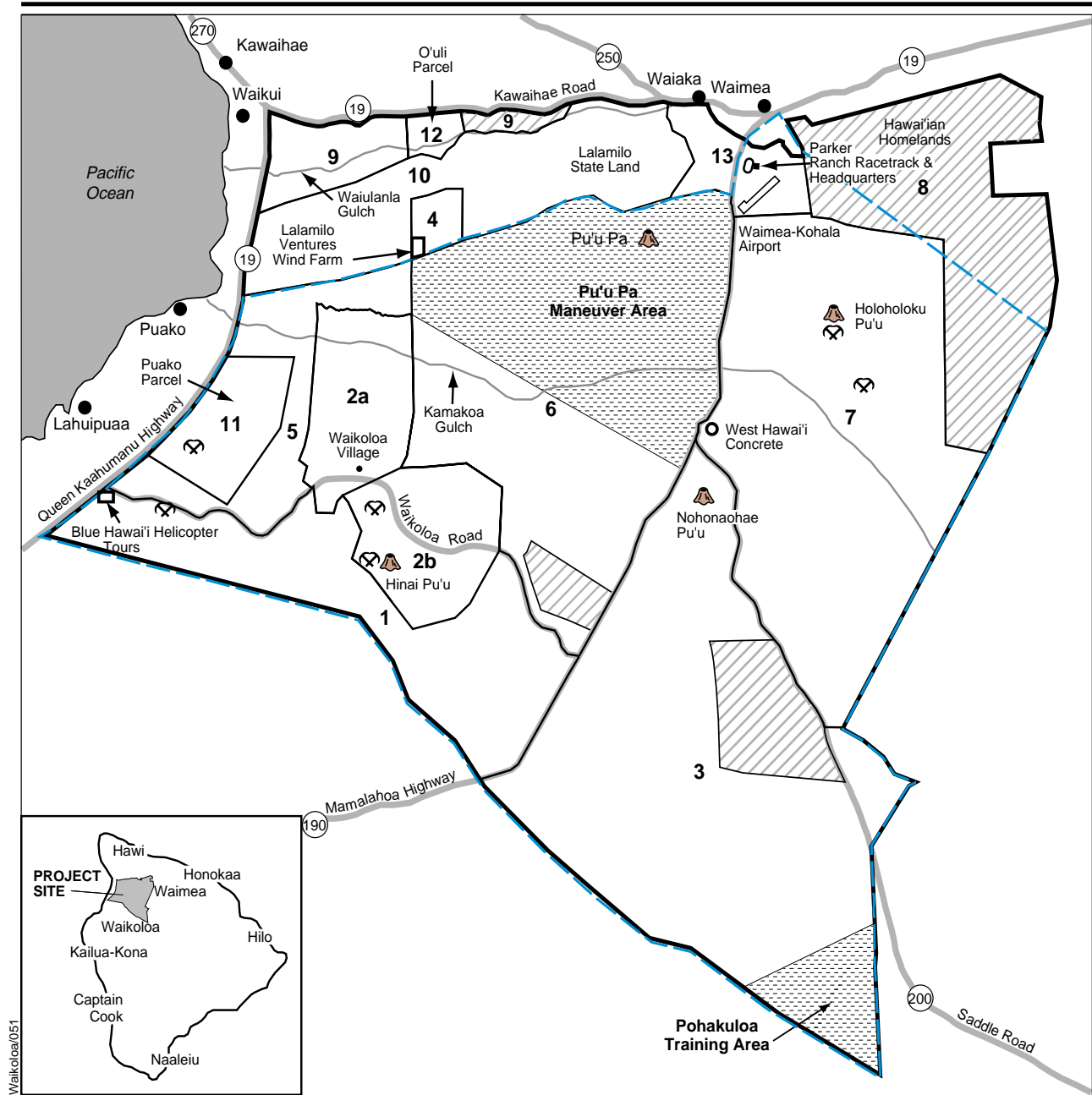
- 28 Mk2 hand grenades
- 6 rifle grenades
- 5 60mm mortars
- 2 37mm HE projectiles
- 1 Japanese type 39 hand grenade.

The Army Explosive Ordnance Disposal (EOD) Unit from Schofield Barracks disposed of these items and numerous .50-caliber bullets that were found in the same area. Two potential UXO items were recently discovered by Parker Ranch employees (May 2001) and reported to the South Kohala Police Department for further investigation.

2.2.2 Investigation Areas within the Former Waikoloa Maneuver Area and Nansay Sites

For purposes of the Phase II EE/CA field investigation, the Former Waikoloa Maneuver Area and Nansay Sites were divided into 13 sectors (Sectors 1 through 13). Sector boundaries, developed for data management purposes, were based on past military usage, current and future land use, land ownership or administration, and prominent geographic features that would enable field personnel to identify specific sector boundaries in the field (Figure 2-2).

Prior to the Phase II EE/CA field investigation, the CEPOH requested right-of-entry to numerous private parcels throughout the former maneuver area. Parcels where right-of-entry was not received (15,321 acres) were excluded from the



Phase II EE/CA Investigation Areas Former Waikoloa Maneuver Area and Nansay Sites

Figure 2-2

Phase II EE/CA field investigation. Additionally, active military training areas (15,301 acres) were also excluded from the Phase II EE/CA field investigation because these areas are still being used by the military. The remaining areas (92,343 acres) were investigated during the Phase II EE/CA.

There are numerous facilities currently in use at the former maneuver area. These facilities are concentrated in Sectors 2, 8, 12, 13 and the east portion of Sectors 9 and 10 (see Figure 2-2). The current land use in these sectors is primarily residential, with commercial and educational facilities in Sector 2 (Waikoloa Village area) and Sector 13 (Waimea/Kamuela). The Waimea-Kohala Airport is situated in Sector 13. Facilities associated with ranching are present in Sectors 2, 3, 6, 7, 8, and 13 with some residential development in the Waiki'i area in Sector 3. Other facilities include the Lalamilo Ventures Wind Farm (Sector 4), the West Hawai'i Concrete Quarry (Sector 7), and several wastewater treatment facilities.

The following sections provide detailed descriptions of each of the 13 sectors within the Former Waikoloa Maneuver Area and Nansay Sites. Table 2-1 lists the 13 sectors, provides the total size of each sector (in acres), shows the acreage excluded from the Phase II EE/CA field investigation (i.e., no right-of-entry and active military training areas), and provides the total acreage investigated during the Phase II EE/CA. The approach, methodology, and results of the Phase II EE/CA field investigation are presented in Chapter 3.0.

Table 2-1. Former Waikoloa Maneuver Area and Nansay Sites - Investigation Areas

Sector Number	Sector Number	Total Size (Acres)	Excluded from EE/CA		Phase II EE/CA Investigation Area (Acres)
			Active Maneuver Areas (Acres)	No Right-of-Entry Areas (Acres)	
1	Kaniku Lava Flow	10,193	--	--	10,193
2	Waikoloa Village	8,317	--	--	8,317
3	Keamuku	28,058	2,292	2,952	22,814
4	Lalamilo Wind Farm	677	--	--	677
5	Waikoloa Road	4,273	--	--	4,273
6	Pu'u Pa Maneuver Area	22,501	13,009	902	8,590
7	Holoholoku	21,601	--	--	21,601
8	Hawai'ian Homelands	11,070	--	11,070	--
9	Kawaihae Road	2,458	--	397	2,061
10	Lalamilo State Lands	8,553	--	--	8,553
11	Puako Parcel	2,629	--	--	2,629
12	O'uli Parcel	493	--	--	493
13	West Waimea/Kamuela Airport	2,142	--	--	2,142
Total		122,965	15,301	15,321	92,343

EE/CA = engineering evaluation/cost analysis

2.2.2.1 Sector 1 - Kaniku Lava Flow

History. This area was originally included within the boundary of the former maneuver area (see Figure 2-2) and was used as a live-fire impact area. There have been no reported discoveries of OE in this area.

Description. Sector 1 consists of 10,193 acres in the southwest region of the Phase II EE/CA project boundary. The boundary of Sector 1 is defined by the South Kohala District boundary to the south, Queen Kaahumanu Highway to the west, Waikoloa Road to the north, and Mamalahoa Highway to the east. A dirt service road allows limited access to the west side of the sector. Rough, barren, a'a lava rock covers the west side of Sector 1 (Photograph 2-3), which presents hazardous walking conditions over much of this area. Soils derived from volcanic deposits are developed on the east side of the sector, supporting kiawe and grasses. Blue Hawai'i Helicopter Tours is situated at the west edge of Sector 1. The remaining area of this sector is undeveloped.

Investigation Area. The total investigation area for Sector 1 is 10,193 acres.

2.2.2.2 Sector 2 - Waikoloa Village

History. This area was originally included within the boundary of the former maneuver area (see Figure 2-2) and was reportedly used for artillery training and as a live-fire target area for off-shore naval gun bombardment. Live OE and OE scrap have been found previously in and around the Waikoloa Village, including a 105mm HE projectile in the elementary school yard in 1994.

Description. Sector 2 consists of 8,317 acres in the west region of the Phase II EE/CA project boundary. For purposes of the Phase II EE/CA field investigation (due to the varied land uses within this area), Sector 2 was subdivided into two separate areas: Sector 2a (Waikoloa Village-West) and Sector 2b (Waikoloa Village-East). Sector 2a comprises 4,062 acres consisting of the Waikoloa Village and adjoining land immediately south of Waikoloa Road (Photograph 2-4). This small area was included into Sector 2a because the area supports facilities/buildings and other human habitation associated with the village. A buffer zone extending at least 1,000 feet beyond the village environs and extending east to the road along the rock wall (for ease of demarcation by field personnel) is included in Sector 2a. This area is characterized by deep washes, gulches, and rough a'a lava rock that are present on the south, east, and west sides of Sector 2a (Photograph 2-5). North of Waikoloa Village, outcroppings of a'a lava rock are sporadic, with sparse vegetation. Waikoloa Village is a residential community consisting of single- and multi-family dwellings, a golf course, and a shopping center. Sector 2b consists of 4,255 acres and is situated to the southeast of Waikoloa Village where future residential development of the village is expected to occur. Terrain conditions in this area are relatively flat with few hills and little or no development. Heavy grasslands cover the majority of this area.



Photograph 2-3. Rough a'a lava typical of Sectors 1, 5, and 11.



Photograph 2-4. Looking north from area south of Waikoloa Road (Sector 2).



Photograph 2-5. Terrain characteristic of Sectors 2, 9, and 10.



Photograph 2-6. Ranchland typical of Sectors 3, 6, and 7.

Investigation Area. The total investigation area for Sector 2a (4,062 acres) and Sector 2b (4,255 acres) is 8,317 acres.

2.2.2.3 Sector 3 - Keamuku

History. This area was originally included within the boundary of the former maneuver area (see Figure 2-2) and was used as a live-fire impact area. There have been no reported discoveries of OE in this area.

Description. Sector 3 consists of 28,058 acres in the southeast region of the Phase II EE/CA project boundary. Sector 3 encompasses the portions of the South Kohala District east of Mamalahoa Highway and south of Saddle Road and is accessible by dirt roads. The tank road (see Figure 2-1) cuts through this area and continues south to the Pohakuloa Training Area. Sector 3 is characterized by rolling hills, grasslands, kiawe and small trees. The terrain on the west side of the sector is very rough and is also covered with grasslands, small trees, and kiawe. Current land uses in Sector 3 include ranching/cattle grazing (Photograph 2-6) and recreational activities (e.g., hiking and hunting). Nohonaohae Pu'u is an area for natural resources conservation in the northwest tip of Sector 3.

Investigation Area. Approximately 2,292 acres of Sector 3 continue to be used for military maneuvers and training exercises through a master lease agreement between the Pohakuloa Training Area and the Parker Ranch (see Figure 2-1). This acreage was not investigated during the Phase II EE/CA because it is still considered an active military training area. A 2,952-acre parcel in the Waiki'i area was not investigated during the Phase II EE/CA because right-of-entry was not granted. The remaining area of Sector 3 (22,814 acres) was investigated during the Phase II EE/CA field investigation (see Figure 2-2).

2.2.2.4 Sector 4 - Lalamilo Wind Farm

History. This area is not within the original boundary of the former maneuver area (see Figure 2-2), but was used as the Lalamilo Firing Range and ground artillery training area. OE scrap has been reported in this area, including high explosive fragments from projectiles that may have been fired from off-shore ships.

Description. Sector 4 consists of 677 acres in the northwest region of the Phase II EE/CA project boundary and is characterized by grassy, rolling hills. This area and the Lalamilo Wind Farm (Photograph 2-7) are accessible by well-maintained paved and dirt roads. Land use in this area consists of conservation, research, and open space.

Investigation Area. The total investigation area for Sector 4 is 677 acres.



Photograph 2-7. Lalamilo Wind Farm (Sector 4).



Photograph 2-8. Development of new homes in O'uli Parcel (Sector 12).

2.2.2.5 Sector 5 - Waikoloa Road

History. This area was originally included within the boundary of the former maneuver area (see Figure 2-2). OE discovered in this area includes live 105mm and 155mm HE projectiles.

Description. Sector 5 consists of 4,273 acres in the west region of the Phase II EE/CA project boundary. Sector 5 is south of the Lalamilo state land and north of Waikoloa Road between Queen Kaahumanu Highway and the 1800s vintage rock wall, excluding Waikoloa Village and the Nansay Puako parcel. Sector 5 is characterized by rough, steep a'a lava beds (see Photograph 2-3) with kiawe and dense vegetation in some areas. Deep ravines are present in the central region of the sector between Sectors 2 and 11. Sector 5 is completely undeveloped.

Investigation Area. The total investigation area for Sector 5 is 4,273 acres.

2.2.2.6 Sector 6 - Pu'u Pa Maneuver Area

History. This area was originally included within the boundary of the former maneuver area (see Figure 2-2) and was used as a live-fire target area for mortar and barrage rockets and infantry maneuvers. Several OE-related injuries and deaths have occurred since 1945 in the area of Sector 6 that comprises the Pu'u Pa Maneuver Area (active military training area not investigated during this EE/CA). In 1945, a road construction worker was killed near Mamalahoa Highway, approximately 3 miles south of Waimea (Kamuela). Two Parker Ranch workers were killed and three injured in 1954 by an 81mm mortar, and in 1983 two servicemen were injured by inadvertent detonation of OE on Pu'u Pa cinder hill (see Figure 2-1).

Description. Sector 6 consists of 22,501 acres in the central region of the Phase II EE/CA project boundary. Sector 6 comprises the area north of Waikoloa Road, between the rock wall and Mamalahoa Highway south of the Lalamilo state land and the developed areas of Waimea (Kamuela). The area is accessible by roads and jeep trails. The tank road (see Figure 2-1) leading to the Pu'u Pa Maneuver Area runs through this area and continues south to the Pohakuloa Training Area. Vegetation varies from grass and brush 3 to 7 feet tall with thickets of kiawe on the northwest side of the sector to sparse vegetation with areas of cacti and eucalyptus trees on the northeast side of the sector. Ground cover in the south portion of the sector consists of 3-foot high grass and loose basalt cobbles and boulders. Topography of the sector varies from flat land to gently rolling hills. Terrain in the west area and portions of the central area of the sector is covered by a'a lava beds and cut by gulches. The primary land use in this area is cattle grazing (see Photograph 2-6).

Investigation Area. A total of 13,009 acres of Sector 6 (Pu'u Pa Maneuver Area) continues to be used for military maneuvers and training exercises through a master lease agreement between the U.S. military and the Parker Ranch. This area was not investigated during the Phase II EE/CA field investigation because it is still considered an active military training area. Also excluded from the EE/CA field investigation was a 902-acre parcel where right-of-entry was not

granted. The remaining 8,590 acres of Sector 6 were investigated during the Phase II EE/CA field investigation.

2.2.2.7 Sector 7 - Holoholoku

History. This area was originally included within the boundary of the former maneuver area (see Figure 2-2). According to record searches, Holoholoku was a live-fire target and assault training area during World War II training for the Iwo Jima invasion. There have been no reported discoveries of OE in this area.

Description. Sector 7 consists of 21,601 acres on the east side of the Phase II EE/CA project boundary (see Figure 2-2). This area is east of Mamalahoa Highway, north of Saddle Road, and is bounded on the north by the Kamuela Airport and the Hawai'iian Homelands south of Waimea (Kamuela). Sector 7 is accessible by roads and jeep trails. Topography of this area varies from flat land to gently rolling hills and pastureland. The primary land use is cattle grazing (see Photograph 2-6). Historically, portions of the area were used for lumbering. Holoholoku pu'u, cinder quarries, and West Hawai'i Concrete are included in this area. Several isolated ranch houses (including stables, corrals, and ranching support facilities) are present throughout the southeast region of this area.

Investigation Area. The total investigation area for Sector 7 is 21,601 acres.

2.2.2.8 Sector 8 - Hawai'iian Homelands

History. Only the southwest edge of this area was originally included within the boundary of the former maneuver area (see Figure 2-2). There have been only anecdotal reports of OE in this area.

Description. Sector 8 consists of 11,070 acres and is situated in the northeast region of the Phase II EE/CA project boundary. This area encompasses the Hawai'iian Homelands area east of Waimea/Kamuela. Grassy pastureland and small farming plots are prevalent throughout Sector 8.

Investigation Area. Because right-of-entry could not be obtained in areas sufficient to characterize Sector 8, the area was excluded from investigation during the EE/CA.

2.2.2.9 Sector 9 - Kawaihae Road

History. This area was not originally included within the boundary of the former maneuver area (see Figure 2-2). The Lalamilo Firing Range is directly south of Sector 9 (see Figure 2-1). Live OE and OE scrap have been found previously in the immediate vicinity of the historic rock wall and near Queen Kaahumanu Highway.

Description. Sector 9 consists of two noncontiguous parcels comprising 2,458 acres in the northwest region of the Phase II EE/CA project boundary. Sector 9 is bounded by Queen Kaahumanu Highway to the west, Kawaihae Road to the north, and the state-administered Lalamilo lands to the south. The

topography of the sector ranges from steep, rough hills composed of a'a lava beds to areas covered with thick grasses and kiawe stands (see Photograph 2-5). The east region of Sector 9 comprises a residential community; the west region is open space that is currently undergoing plans for future construction.

Investigation Area. The east half of Sector 9 was not investigated because right-of-entry was denied during the EE/CA field investigation. The west half of Sector 9 (2,061 acres) was investigated during the EE/CA field investigation.

2.2.2.10 Sector 10 - Lalamilo State Lands

History. This area was not originally included within the boundary of the former maneuver area (see Figure 2-2), but was used as the Lalamilo Firing Range and ground artillery training area, where it was used by the Marines during the Korean Conflict and for joint international maneuvers as late as the 1990's. Live OE and OE scrap have been recovered previously in this area.

Description. Sector 10 consists of 8,553 acres in the northwest region of the Phase II EE/CA project boundary. Sector 10 comprises the Lalamilo state land and extends from Queen Kaahumanu Highway to the developed area west of Waimea (Kamuela) between Sectors 5, 6, 9, and 12. The tank road (see Figure 2-1) leading to the Pu'u Pa Maneuver area runs through this area and continues south to the Pohakuloa Training Area. The topography of the sector consists of steep, rough hills of a'a lava rock in the east portion (see Photograph 2-5), which gradually flatten out to the west. Sector 10 is used for ranching and grazing, with residential development expected in the future. The vegetation in this area is primarily grasslands.

Investigation Area. The total investigation area for Sector 10 is 8,553 acres.

2.2.2.11 Sector 11 - Puako Parcel

History. This area was originally included within the boundary of the former maneuver area (see Figure 2-2) and was used as an artillery firing range. Live OE and OE scrap have been found previously in this area. Additionally, an expended 105mm HE round, an expended 155mm illumination round, and large amounts of artillery round fragments and fuze components were found during two OE surveys of this area (Donaldson Enterprises, Inc., 1990 and 1993).

Description. Sector 11 consists of 2,629 acres along the westernmost edge of the Phase II EE/CA project boundary. Sector 11 is on the east side of Queen Kaahumanu Highway, approximately 4 miles south of the highway's intersection with Kawaihae Road. The parcel is accessible by vehicle from primary public roads serving the communities of Kailua-Kona, Waikoloa, and Kawaihae. Travel throughout the parcel is via several unpaved jeep trails. Site access is also possible by foot along or off the jeep trails. The topography in this area is uneven consisting of low hills and shallow gullies covered primarily by low-lying vegetation (i.e., fountain grass). Sector 11 is almost completely covered by rough a'a lava rock, making large portions of the sector impassable (see

Photograph 2-3). North and south of the Puako parcel is vacant, undeveloped land; east of the parcel is the Waikoloa Village. Sector 11 is currently being developed as a golf course community.

Investigation Area. The total investigation area for Sector 11 is 2,629 acres.

2.2.2.12 Sector 12 - O'uli Parcel

History. This area was not originally included within the boundary of the former maneuver area (see Figure 2-2), but was used as an artillery firing range and as a ground attack training area. Live OE and OE scrap have been recovered in this area in the past, including two intact Mk2 hand grenades that were recovered during a previous OE survey of this area (Donaldson Enterprises, Inc., 1993).

Description. Sector 12 consists of 493 acres in the northwest region of the Phase II EE/CA project boundary. Sector 12 is situated along Kawaihae Road approximately midway between the communities of Waimea (Kamuela) to the east and Kawaihae to the west. The parcel is bounded on the north by Kawaihae Road. To the south are Keanuimano and Waiulaula Streams. The O'uli Parcel is accessible by vehicle from primary public roads serving the communities of Waimea (Kamuela), Kawaihae, and Kohala. Travel throughout this area is by means of several unpaved jeep trails. Site access is also possible by foot along or off the jeep trails. The topography in this area is uneven, consisting of low hills and rock outcrops. Beginning in July 1995, construction of a single-family residential subdivision had commenced in this area and development is ongoing (Photograph 2-8). As construction progresses throughout this parcel, paved roadways allow easier access into this area.

Investigation Area. The total investigation area for Sector 12 is 493 acres.

2.2.2.13 Sector 13 - West Waimea/Kamuela Airport

History. Only the east side of this sector was originally included within the boundary of the former maneuver (see Figure 2-2) and was the site of Camp Tarawa from 1943 to 1946. The base encampment consisted of approximately 467 acres of tents, quonset huts, and other temporary facilities. Infantry maneuvers were conducted in and around Camp Tarawa (see Figure 2-1). There have been no reported discoveries of OE in this area.

Description. Sector 13 consists of 2,142 acres in the north region of the Phase II EE/CA project boundary. Sector 13 encompasses the developed areas of Waimea (Kamuela) south of Kawaihae Road and west of the Hawai'ian Homelands. Current land uses in this area are residential and agricultural. Structural features include the historic Parker Ranch Buildings, the Parker Ranch Headquarters, the Waimea-Kohala Airport, Hawai'ian Homelands, and shopping areas. This area is widely used by the local community, as well as tourists visiting the area.

Investigation Area. The total investigation area for Sector 13 is 2,142 acres.

2.3 PREVIOUS INVESTIGATIONS

In December 1991, a helicopter survey and subsequent drive and walk-through survey was conducted by the USACE, Pacific Ocean Division (Earth Tech, 1997a). The survey was conducted throughout the 91,000 original acres of the former maneuver area (see Figure 2-1). Large amounts of artillery fragments and several different types of fuzes were located.

In November 1992, several walk-through visual and OE locator surveys were conducted by DEI under contract to the CEPOH. The surveys were conducted within the former Lalamilo Firing Range (see Figure 2-1). OE-related items identified within this area were primarily found on the surface and included the following:

- Shrapnel (artillery projectile fragments)
- Fuze components
- Burned-out rounds
- Low-order rounds (i.e., not all explosives expended)
- 4.5-inch barrage rockets
- 81mm mortars
- 105mm and 155mm HE fragments
- 30-caliber and 50-caliber small arms
- Hand grenades
- Munitions containing white phosphorus.

In April 1996, a site visit to the former maneuver area was conducted by the CEHNC and the CEPOH. The purpose of the survey was to inspect six parcels situated within the Parker Ranch property that were currently proposed for development. The following items were seen during the site visit:

- Mortar fragments
- Tail section from a 60mm mortar
- Fragments from a Mk2 hand grenade
- Land mine fuzes
- 7.62-caliber ammunition (live and expended)
- 30-caliber small arms ammunition
- Hand grenade fuze
- Propellant charge cans
- 75mm HE fragments
- 60mm illumination rounds
- 105mm HE fragments
- 81mm HE fragments
- 76mm PD fuze
- 60mm nose fuze.

In August 1996, Earth Tech conducted a Phase I site survey for a 3,000-acre area situated within the southwest portion of the former maneuver area near the Puako parcel. The Phase I Environmental Assessment was conducted in support of the development of a golf course community. OE scrap was identified throughout the parcel; however, the highest densities of OE scrap were located approximately 1 mile inland near the confluence of Awaiakeakua Gulch and an

unnamed gulch and in the northwest corner of the parcel along the Queen Kaahumanu Highway. No intact ordnance was found during this survey; however, heavily vegetated areas were not thoroughly searched.

In September 1997, the Phase I EE/CA field investigation was conducted by Earth Tech under contract to the CEHNC (Project No. H09HI035901). Between September and October 1997, a total of 96 sampling grids (91 100-foot by 100-foot grids and 5 10-foot by 400-foot grids) distributed over 6 investigation areas (Areas A-F) were geophysically surveyed and statistically sampled (Figure 2-3). The Phase I EE/CA was performed in an area not addressed or included as part of the Phase II EE/CA investigation. The Phase I EE/CA was performed primarily in the Pu'u Pa Maneuver Area (see Figure 2-2), where active military training maneuvers are still being conducted by the U.S. military. The investigation of the Phase I EE/CA project area yielded 2 UXO items (4.5-inch barrage rocket in Area D - Pu'u Pa Cinder Hill; 60mm mortar in Area C - Wastewater Treatment Area) and 96 OE scrap items (inert and nonhazardous). Both UXO items were rendered safe by explosive demolition.

The recommendations that were made as a result of the Phase I EE/CA field investigation are presented in the *Phase I Engineering Evaluation/Cost Analysis, Former Waikoloa Maneuver Area - Parker Ranch, Kamuela, Island of Hawai'i, Hawai'i* (Earth Tech, 1999a). These recommendations included institutional controls (i.e., OE safety awareness training program, community awareness, educational media) and construction support.

2.4 PREVIOUS REMOVAL ACTIONS

Two ordnance clearance efforts were conducted, one prior to the departure of the 5th Marine Division (1946) and the other in 1954 following the accidental detonation of a UXO item that killed two civilians and seriously injured three others (see Figure 2-1). The extent of the surface clearance areas are unclear; however, previous records give the impression that the clearances were conducted over the entire 91,000 acres of the original former maneuver area. The clearances were conducted by Middle Pacific (MIDPAC) Engineers Operations and EOD units from Fort Shafter and Hickam Air Force Base (AFB).

The clearances discovered live OE items including hand grenades; 60mm, 81mm, and 4.2-inch mortars; 75mm shells; 105mm and 155mm shell fuzes; and 37mm anti-tank cannon shells. The Lalamilo Firing Range was included in the 1954 surface clearance effort. It was noted during these clearance efforts that certain areas were impossible to search (i.e., areas around large cacti) and that OE could still be present.

Local newspaper reports from 1954 indicate that the EOD units disposed of the following items: 37mm, 75mm, 105mm, and 155mm shells; 60mm, 61mm, 81mm, and 4.2-inch mortars; 2.36-inch, 3.5-inch, and 4.5-inch rockets; 2.75-inch bazooka rockets; hand and rifle grenades; fuzes from 47mm anti-tank Japanese armor piercing rounds; and Japanese 25mm anti-tank or anti-aircraft rounds.

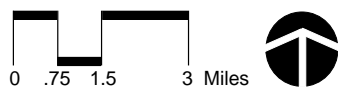
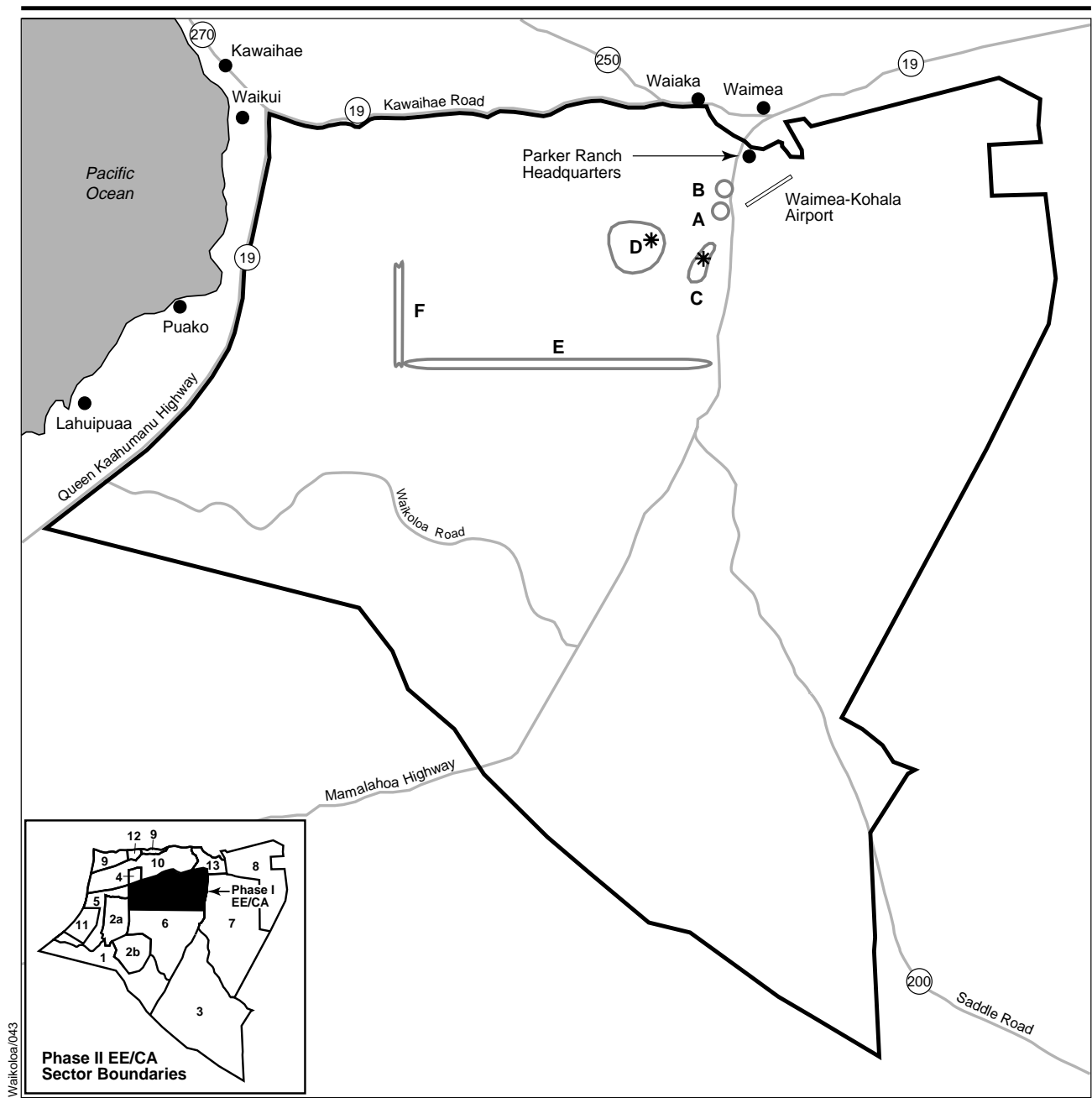


Figure 2-3

The EOD units disposed of 1,013 live OE items found during the surface clearance (158 Federal Supplement 394).

In September 1990, an OE survey was conducted on an 866-acre parcel near Waikoloa. The investigations were conducted by DEI. One 105mm illumination round and numerous pieces of shrapnel were identified. Based upon the survey and subsequent interviews with military personnel, it was determined that the area was situated within the former maneuver area artillery firing range. Other than the 105mm illumination round, no other intact ordnance was identified; however, heavily vegetated deep gullies were not searched.

In July 1995, DEI was contracted by the Parker Ranch to perform an OE investigation along the construction access road, at the wastewater treatment plant, and the sewer interceptor line (Sector 6). The purpose of the survey was to determine the extent and magnitude of OE on the site. The survey involved the use of a cesium vapor magnetometer and fluxgate magnetometers (geophysical detection equipment). The items recovered included fragments from Mk2 hand grenades, expended 60mm illumination rounds, rifle grenades, and bazooka rounds.

2.5 DEMOGRAPHIC PROFILE

The population of Hawai'i County has grown steadily since 1980. According to the 2000 U.S. Census, the County's population increased 23 percent between 1990 and 2000. During the same period, the State's population grew by 9 percent. The district of Puna saw the largest increase at 51 percent, followed by South Kohala (44 percent), North Kohala (41 percent), Ka'u (31 percent), North Kona (28 percent), South Kona (12 percent), North Hilo (12 percent), Hamakua (10 percent), and South Hilo (6 percent).

The County's population is projected to grow from 148,677 to 217,718 from 2000 to 2020. The growth of the population in the South Kohala District is projected to grow from 13,131 to 24,426 during this same time period. The projections of resident population by district is provided in Table 2-2.

The primary economic activities of the South Kohala District are tourism, cattle ranching, agriculture, public and private educational institutions, scientific research associated with the observatories situated on Mauna Kea, and health and wellness organizations.

Due to the growth in tourism within the district, the population of South Kohala has increased drastically over the past 30 years. The benefit of this growth for the residents of South Kohala is the lowest unemployment rate and the highest median household income for 1997 of all the districts within the county.

There is considerable investor interest in the South Kohala District. The three large resort complexes in the district (i.e., Mauna Kea Resort, Mauna Lani Resort, and Waikoloa Beach Resort) currently account for 40 percent of the total hotel rooms within the County. The South Kohala District is one of the best

Table 2-2. Projection of Resident Population by District - Year 2000 to 2020

District	2000	2005	2010	2015	2020
County of Hawai'i	148,677	159,907	176,938	195,965	217,718
Puna	31,335	36,351	42,591	49,801	58,246
South Hilo	47,386	46,273	47,477	48,614	49,791
North Hilo	1,720	1,643	1,720	1,798	1,879
Hamakua	6,108	6,196	6,561	6,933	7,328
North Kohala	6,038	6,622	7,917	9,446	11,273
South Kohala	13,131	15,659	18,184	21,072	24,426
North Kona	28,543	30,467	34,024	37,922	42,275
South Kona	8,589	10,253	11,414	12,681	14,092
Ka'u	5,827	6,443	7,050	7,698	8,408

Data Sources: Economic Assessment, PKF Hawai'i, January 2000
U.S. Census, 2000
Hawai'i County Department of Research and Development

destinations in the state for world-class golf courses. During the period between 1980 and 1998, 10 properties were developed totaling 3,400 visitor units. The larger of these resort properties include the 547-unit Outrigger Waikoloa Beach Hotel, the 350-unit Mauna Lani Bay Hotel & Bungalows, the 1,240-unit Hilton Waikoloa Village, the 539-unit Orchid at Mauna Lani, and the 351-unit Hapuna Beach Prince Hotel.

Although tourism is currently the leading economic industry in the district, the area is also well known for cattle ranching, vegetable production, egg production, and other forms of agriculture. Waimea (Kamuela) is one of the most productive areas for vegetable crops on the Island of Hawai'i. Cabbages, celery, lettuce, daikon (turnip), peppers, broccoli, and carrots are just some of the vegetables grown. Experiments are being conducted on different crops, as well as on the improvement of those presently grown. The agricultural industry, especially truck farms, has potential for further expansion.

The cattle ranching industry utilizes most of the land area within the district with pastures situated on the higher slopes of the mountains and extending down to the sea. The Parker Ranch, one of the largest privately owned ranches in the world, has its headquarters in Waimea (Kamuela).

The Hawai'i Preparatory Academy in Waimea (Kamuela) had a 1999 total enrollment of 578 students in grades K through 12 (including 190 boarders from grades 6 through 12). Parker School is a day school with a 1999 enrollment of 129 students. Waimea has three performing arts venues: Kahilu Theatre, Gates Performing Arts Center, and Parker School Auditorium.

The Canada-France Hawai'i Telescope on Mauna Kea has its base facility in Waimea. Waimea is also home to the headquarters of the W.M. Keck Observatory on Mauna Kea, the largest optical and infrared telescope in the world.

2.6 CURRENT AND FUTURE LAND USE

The current and future land uses for the Former Waikoloa Maneuver Area and Nansay Sites are reported in the Institutional Analysis (Chapter 5.0). A brief summary of site access and current and future land use is provided in the following subsections.

2.6.1 Site Access

Current policy regarding use of roads and trails at the former maneuver area is primarily dependent upon ownership of individual properties and current land use. Both paved and unpaved roads can be found throughout the former maneuver area. Generally, roads that access developed areas within the former maneuver area are paved and unrestricted. Roads that access undeveloped areas (e.g., Parker Ranch grazing land) are generally unpaved, restricted by locking gates, and can be accessed only by landowners. Most of the investigation areas (i.e., sectors) within the former maneuver area are easily accessible from state highways or major roads.

2.6.2 Current and Future Land Use

Based upon information presented in the Institutional Analysis (Chapter 5.0) and the *General Plan, Hawai'i County* (County of Hawai'i, 1989), current and future land use for the former maneuver area was grouped into three distinct categories. These categories were developed based on the likelihood of public access and intrusive activities that would result in excavation of the soil, thereby potentially exposing the public to OE. The current and future land uses at the former maneuver area can be categorized into the following three land use groups:

- **Group I** - Land uses consisting of open areas (parks, recreation, and historic sites), conservation areas (forest and water reserves), and extensive agricultural areas (pastureland and ranchland).
- **Group II** - Land uses consisting of agricultural districts including intensive agricultural lands and other agricultural lands (low capacity for intensive cultivation).
- **Group III** - Land uses consisting of commercial areas, multiple residential areas (low- to high-density urban and proposed urban expansion), rural districts (small farms mixed with low-density residential lots with maximum 1/2-acre lots), industrial areas, and resort areas (i.e., golf courses).

Based on the three developed land-use groups and information taken from the County of Hawai'i General Plan, most of the investigation areas (i.e., sectors) at the former maneuver area fall into more than one land use group. A more detailed discussion of land uses at the former maneuver area can be found in the Institutional Analysis (Chapter 5.0).

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